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(54) **ELECTRONIC DEVICE**

ELEKTRONISCHE VORRICHTUNG

DISPOSITIF ÉLECTRONIQUE

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Description

[0001] This application is based on Japanese Patent Application No. 2013-217396 filed on October 18, 2013.

[0002] The present disclosure relates to an electronics device for vehicles that includes a printed circuit board for constituting an electronic circuit.

[0003] With regard to the conventional electronic device, an electromagnetic wave as an interference wave may leak out from, for example, an electronic component and wiring pattern mounted on a printed circuit board and hence affects an external electronic device.

[0004] Accordingly, for the conventional electronic device, the electromagnetic wave emitted from the printed circuit board can be absorbed by arranging an electromagnetic wave absorbing sheet around the printed circuit board and connecting the ground pattern of the printed circuit board to a metal plate, which encloses a casing and the inner surface of the casing (for example, see document JP-2008-176567 A).

[0005] In other words, the radiation noise above a regulated level can be prevented from leaking out from the electronic device by absorbing the electromagnetic wave emitted from the printed circuit board through the electromagnetic absorbing sheet or the casing.

[0006] In addition, document JP H11 31891 A relates to a holding method and holding structure of a printed circuit board in the inside of a housing of an electronic device and discloses a number of projections to pinch the printed circuit board without any spacing between a protrusion and a solid dielectric material, and document US 4 967 316 A relates to an electric circuit unit featuring a grounded housing and a printed circuit board wherein resin coating is used but no connecting protrusion part is provided.

[0007] However, for example, when the specification for an electronic device is changed for saving cost, an existing component is used on the printed circuit board constituting, for example, a control circuit, and the size or shape of an electronic component or a peripheral device as a control object and the casing including the electronic component or the peripheral device is changed.

[0008] In this situation, since the surrounding environment of the printed circuit board changes, the grounding position to the casing side of the printed circuit board and the EMI (Electro Magnetic Interference) measure to the printed circuit board must be changed.

[0009] However, for changing the EMI measure to the printed circuit board, the existing printed circuit board cannot be used anymore and hence the cost for a printed circuit board (in addition to an electronic device) rises.

[0010] In particular, when, for example, a new EMI measure to the existing printed circuit board is carried out, on the printed circuit board, an electronic component is mounted on a position to be connected to the casing for the EMI measure, and resin film (the so-called solder resist) is formed for preventing soldering.

[0011] In this situation, one portion of the wiring pattern

formed on the printed circuit is changed for offsetting the position of the electronic component, or one portion of the solder resist is peeled off. However, with regard to these methods, the existing printed circuit board cannot still be used and hence the cost of a printed circuit board (in addition to an electronic device) rises.

[0012] It is an object of the present disclosure to provide an electronic device for vehicles that enables EMI measurement to be carried out without changing the configuration of a printed circuit board, wherein the size and/or shape of a capacitive coupling element represented by protruding parts to actual electrical requirements shall be adaptable without the restriction of mechanical influence of these elements on the printed circuit board.

[0013] According to the invention, this object is accomplished by an electronic device for vehicles as defined in claim 1. Advantageous further developments are subject of the accompanying dependent claims.

[0014] As defined, an electronic device for vehicles according to an aspect of the present disclosure includes: a printed circuit board that is mounted with an electronic component to configure a predetermined electronic circuit; and a conductive casing that stores the printed circuit board.

[0015] A connecting part is arranged between the conductive casing and the printed circuit board. A resin film for preventing from being soldered is arranged at a board surface of the printed circuit board to be capacitively coupled with the connecting part. The connecting part is configured to be capacitively coupled with a conductor pattern of the printed circuit board so as to guide radiation noise from the printed circuit board to the conductive casing, and the connecting part is configured by a number of protruding parts, which are arranged to protrude to the conductive casing having a gap between the conductor pattern and the protruding part, and are capacitively coupled with the conductor pattern through spacing arranged in the gap. The distance between a ground pattern and the protruding part is larger than the thickness of the solder resist located on top of the ground pattern so there is no direct mechanical contact between the solder resist and the protruding part. The number or size of the protruding parts is configured to allow radiation noise to be at a tolerance level.

[0016] Accordingly, the radiation noise from the printed circuit board is guided to the conductive casing without making direct connection between a conductive member and the grounding surface of the printed circuit board.

[0017] The EMI measure may be performed without arranging a grounding pattern for connecting to the conductive casing at the printed circuit board and exposing the grounding pattern.

[0018] Accordingly, the printed circuit board is shared among different types of electronic devices with difference specification such as the shape or size of the conductive casing so that the mass production of the printed circuit board is achieved. Furthermore, the cost reduction for the printed circuit board in addition to the electronic

device is also achieved.

[0019] The above and other objects, features and advantages of the present disclosure will become more apparent from the following detailed description made with reference to the accompanying drawings. In the drawings:

[Fig. 1A]

Fig. 1A is a cross-sectional view of the configuration of a display device according to an embodiment;

[Fig. 1B]

Fig. 1B is an enlarged diagram of the region 1B in Fig. 1A;

[Fig. 2]

Fig. 2 is an explanatory diagram that shows a state of a printed circuit board inside the display device from a rear surface side; and

[Fig. 3]

Fig. 3 is an explanatory diagram that shows the configuration of a protective cover provided at the rear surface side of the display device.

[0020] The following describes an embodiment of the present disclosure with reference to the drawings.

[0021] The present disclosure is not restricted to the after-mentioned embodiment. An undescribed embodiment, which may be one part of the configuration of the after-mentioned embodiment for solving the difficulty, may also be one of the embodiments in the present disclosure. An embodiment, which is considered to be within the scope of the present disclosure specified by the description in the claims, may also be one of the embodiments in the present disclosure. In addition, reference numerals used in the following description of the embodiment may also be used in the claims for easily understanding the present disclosure; thus, the reference numerals are not used for restricting the scope of the present disclosure.

[0022] An electronic device for vehicles of the present embodiment is a display device 4 for a vehicle that includes a liquid display panel 2 having a display surface on which a touch panel is laminated.

[0023] As illustrated in Fig. 1A and Fig. 1B, the display device 4 of the present embodiment includes a main holder 10 in which a panel holder 10a is arranged for holding the liquid crystal panel 2 at the surface side (i.e., the lower side in Fig. 1A) and a board container 10b is arranged for storing two printed circuit boards 20, 30 at the rear surface side (i.e., the upper side in Fig. 1B).

[0024] The main holder 10 is configured by working a metal plate through, for example, pressing. A plurality of board holders 12 are distributed so as to be arranged to be parallel to the printed circuit board 10 with predetermined spacing at the rear surface side of the main holder 10. It is noted that the board holder 12 is configured by the metal plate that is similar to the main holder 10.

[0025] The printed circuit board 20 includes: a power source circuit; an input circuit that takes an operational

signal from the touch panel arranged at the liquid crystal display panel 2; and an output circuit that outputs a video signal for display to the liquid crystal display panel 2.

[0026] Accordingly, the wiring pattern and ground pattern for constituting each of circuits on the printed circuit board 20. An electronic component 22 for constituting each of the circuits is mounted on the rear surface of the liquid crystal panel 2 at the opposite side. A connector 24 for connecting a vehicular battery or other external vehicular devices is also mounted at the rear surface side of the liquid crystal display panel 2.

[0027] In addition, the printed circuit board 20 is fixed to the board holder 12 through a male screw (hereinafter referred to as "screw") 14, whose head part is arranged with cross recess, such that the printed circuit board 20 has a potential level identical to the main holder 10.

[0028] It is noted that a solder resist 28 is carried out on the rear surface of the printed circuit board 20 excluding a soldering part of the electronic component 22 or the connector 24 and a grounding part 26, which is held by the board holder 12 and the screw 14 (see Fig. 2).

[0029] With regard to the fixing part where the printed circuit board 20 is fixed to the board holder 12, at the rear surface side of the printed circuit board 20, a board holder 16, which is arranged to be parallel to the printed circuit board 30 with predetermined spacing, is arranged at the rear surface side of the printed circuit board 20.

[0030] In addition, similar to the printed circuit board 20, the board holder 16 is fixed to the board holder 12 (in addition to the main holder 10) through the screw 14. It is noted that, as similar to the main holder 10 and the board holder 12, the board holder 16 is also configured by a metal plate.

[0031] The printed circuit board 30 is a main circuit board that is connected to a navigation device or an audio device mounted to a vehicle; and generates image data to be displayed at another display panel as the liquid crystal display panel 2 or a second display.

[0032] Accordingly, as shown in Fig. 2, the wiring pattern and ground pattern, which are for mounting a variety of electronic components including: an IC chip 32a such as an arithmetic circuit or a memory circuit required for image processing; a chip component 32b such as a resistor or a capacitor; and a card socket 32c for fitting a card-type flash memory (i.e., an SD card), are arranged at the printed circuit board 30, and these electronic components are mounted on the printed circuit board 30.

[0033] In addition, the printed circuit board 20 and the connector 34, which is used to connect a variety of peripheral devices such as a second display, navigation device, audio device, a transmitter for wirelessly sending an abnormal signal such as theft to outside of the vehicle, are mounted to the rear surface side of the printed circuit board 30.

[0034] In addition, the printed circuit board 30 is arranged to be parallel to the rear surface side of the printed circuit board 20 with predetermined spacing by fixing the printed circuit board 30 through the screw 14 to the board

holder 16 arranged at the rear surface side of the printed circuit board 20.

[0035] Similar to the printed circuit board 20, a solder resist 38 is performed on the rear surface of the printed circuit board 30 excluding the part where a variety of electronic components 32a to 32c or the connector 34 is soldered and the grounding part 36 held by the board holder 16 and the screw 14.

[0036] In this manner, the printed circuit boards 20, 30 are fixed to the board storage 10b of the main holder 10 through the board holders 12, 16 in order. Subsequently, the printed circuit boards 20, 30 are stored inside the board storage 10, and the protective cover 40 for protecting the printed circuit boards 20, 30 from outside is fitted at the opening part of the board storage 10b by covering the printed circuit boards 20, 30 from the rear surface side.

[0037] The protective cover 40 includes a conductive casing storing the printed circuit boards 20, 30 that is similar to the main holder, and is configured by working a metal plate through, for example, pressing that is also similar to the main holder 10.

[0038] A fixing part 42 is abutted to one part of the plurality of grounding parts 36 (i.e., three of five locations at the bottom of the grounding parts 36) where the solder resist 38 is not arranged, and is fixed by the screw 14 at the board holder 16 with the printed circuit board 30. In addition, the fixing part 42 is protruded to the protective cover 40.

[0039] The fixing part 42 is arranged together with the protective cover 40 by forming a recess part 42a having a hole for inserting the screw 14 at the central part of the fixing part 42 by making the metal plate constituting the protective cover 40 dented toward the printed circuit board 30 side.

[0040] With regard to the display device 4, the printed circuit boards 20, 30 and protective cover 40 are fixed to the main holder 10 in the following procedures (1) to (4).

(1) Initially, by using the screw 14, the printed circuit board 20 and the board holder 16 are fixed to the board holder 12 arranged at the main holder 10.

(2) Next, the printed circuit board 30 is placed on the board holder 16, and then the printed circuit board 30 is fixed through the screw 14 to the board holder 16 arranged at the upper two locations illustrated in Fig. 2.

(3) Subsequently, the grounding part 36 of the printed circuit board 30 is held between the fixing part 42 and the remaining board holders 16 (i.e., the bottom three of the board holders in Fig. 2), which do not fix the printed circuit board 30 through the screw 4, by positioning the protective cover 4 from the top of the printed circuit board 30.

(4) Lastly, the screw 14 is fixed to the board holder 16 from outside of the protective cover 40 by putting the screw 14 through the hole arranged at the fixing part 42 of the protective cover 40.

[0041] The printed circuit board 20, 30 are surrounded by the main holder 10 and the protective cover 40; therefore, radiation noise emitted from the printed circuit board 20, 30 is blocked by the main holder 10 and the protective cover 40 so that the radiation noise above the regulated level can be prevented from leaking out.

[0042] However, as the predetermined EMI measurement is carried out for measuring radiation noise leaking out from the display device 4 by operating the display device 4, the radiation noise leaking out from the card socket 32c cannot be reduced to the tolerance level with the above configuration only.

[0043] It is considered that, at the printed circuit board 30, three locations at the bottom both ends and center illustrated in Fig. 2 are connected to the protective cover 40 through the fixing part 42; however, the upper part illustrated in Fig. 2 is not connected to the protective cover 40, the radiation noise generated at the upper part cannot flow to the protective cover 40.

[0044] For the display device 4 according to the present embodiment, in order to achieve the desired measurement result of the EMI test, two locations at the surrounding of the printed circuit board 30 (i.e., the upper two locations illustrated in Fig. 2), which are not directly connected to the protective cover 40, are configured as a capacitive coupling part 37 for making capacitance coupling between the ground pattern of the printed circuit board 30 and the protective cover 40.

[0045] In particular, as shown in Fig. 3, at the protective cover 40, a protruding part 44 is arranged for making capacitive coupling with the ground pattern of the printed circuit board 30 at the position, which is opposite to the capacitive coupling part 37 when the protective cover 40 is put on the printed circuit board 30.

[0046] In Fig. 3, the reference numeral 46 represents a terminal insertion hole for inserting a terminal for connecting to the connectors 24, 34 provided at the printed circuit boards 20, 30; and the reference numeral 48 represents a fan attachment hole for attaching a cooling fan.

[0047] Accordingly, when the display device 4 is assembled with the procedures (1) through (4), as illustrated in the enlarged drawing in Fig. 1B, the gap D is formed between the protruding part 44 and the ground pattern 31 of the printed circuit board 30, and each of the parts is made to be capacitive coupling through the gap D.

[0048] Thus, for the display device 4 in the present embodiment, the radiation noise generated at the printed circuit board 30 flows to the protective cover 40 through the fixing part 42 and the protruding part 44, which are arranged at the center and the surrounding of the printed circuit board 30. Accordingly, with regard to the present embodiment, the radiation noise leaking out to the surrounding of the display device 4 can be effectively minimized.

[0049] With regard to the display device 4 in the present embodiment, the protruding part 44 is arranged for making capacitive coupling with the ground pattern of the printed circuit board 30 at the protective cover 40 for per-

forming the EMI measure at the location where the solder resist 38 is arranged at the printed circuit board 30.

[0050] With regard to the display device 4 in the present embodiment, by arranging the protruding part 44 at the protective cover 40, the EMI measure can be carried out without changing the shape of the conductor pattern or solder resist at the printed circuit board 30.

[0051] Accordingly, with regard to the display device 4 of the present embodiment, the printed circuit board 30 used at the other display devices for other purpose may still be used. In addition, the display device 4 and other display devices may commonly use the printed circuit board 30. The present embodiment achieves the cost saving by increasing the versatility of the printed circuit board 30 and mass production of the printed circuit board 30.

[0052] Subsequently, through the capacitive coupling between the protruding part 44 arranged at the protective cover 40 and the ground pattern 31 of the printed circuit board 30, in order to check that the radiation noise can be reduced, the display device 4 is created and then the EMI test is performed for measuring the signal level of the radiation noise leaking out to the surrounding of the display device 4.

[0053] With regard to the EMI test, the signal level of a high frequency signal at a frequency of 950 MHz generated at the surrounding of the display device 4 is measured when operating the display device 4 in a case where a conductive gasket as the protruding part 44 is arranged at the protective cover 40 and in a case where the conductive gasket is not arranged at the protective cover 40.

[0054] As a result, the signal level of the high frequency signal in a case of not providing the gasket is 36 dB μ V/m (about 63.10 μ V/m); and the signal level of the high frequency signal in a case of providing the gasket is 27 dB μ V/m (about 22.93 μ V/m).

[0055] Accordingly, as comparing the case of providing the protruding part 44 at the protective cover 40 to the case of not providing the protruding part 44 at the protective cover 40, the radiation noise is reduced by a level at about 40 μ V/m.

[0056] In this EMI test, since the gasket is abutted to the printed circuit board 30, the gap D between the protruding part 44 and the ground pattern 31 of the printed circuit board 30 is the thickness of the solder resist 38.

[0057] It is considered that the effect of decreasing radiation noise through the protruding part 44 is changed through the capacitive coupling between the protruding part 44 and the ground pattern of the printed circuit board 30. In addition, it is considered that the effect of decreasing radiation noise is lowered when the tip part of the protruding part 44 cannot be abutted to the solder resist 38 at the surface of the printed circuit board 30.

[0058] When the signal level of the high frequency signal leaking out to the surrounding of the display device 4 is measured for the degree of variation as the gap D gets larger, the signal level of the high frequency signal in a case of the gap D set at 1.5 mm is 33 dB μ V/m. The

decreasing effect of the radiation noise can be achieved even when the gap D is made larger.

[0059] When the present disclosure is applied to the electronic device, in view of product dispersion, the number or size of protruding parts for making capacitive coupling with the conductive pattern of the printed circuit board and the gap (i.e., gap D) between the protruding part and the conductor pattern of the printed circuit board may be properly configured so as to allow the radiation noise leaking out from the electronic device to be at the tolerance level.

(Modification Example)

[0060] The above describes one aspect of the present disclosure. However, the present disclosure is not limited to the above embodiment. Several embodiments may be made given that the variation is made within the scope of the present disclosure as defined by the appended claims.

[0061] For example, the above embodiment describes that the protruding part 44 is arranged at the protective cover 40 made of a conductive casing as a connecting part for capacitance coupling with the printed circuit board 30. However, the gasket, which can be directly abutted to the board surface of the printed circuit board 30 where the solder resist 38 is arranged.

[0062] The number of components for EMI measure is increased by the part of gaskets. However, since the gap D between the conductive casing and the conductor pattern of the printed circuit board may be configured at the thickness of the solder resist 38, the radiation noise toward the conductive casing can be effectively absorbed.

[0063] The above embodiment describes that the conductor pattern, which is capacitive coupled with the protruding part 44 as the connecting part, is the ground pattern of the printed circuit board 30. However, the protruding part 44 may be arranged to have capacitive coupling with the wiring pattern formed on the printed circuit board 30. Therefore, an unnecessary high frequency signal flowing into the wiring pattern of the printed circuit board 30 can be absorbed by the conductive casing.

[0064] The above embodiment describes that the main holder 10 and the protective cover 40 for constituting the conductive casing are configured by the metal plate. However, the conductive main holder 10 and the conductive protective cover 40 may also absorb (or shield) the radiation noise from the printed circuit board. Accordingly, the main holder 10 and the protective cover 40 may be configured by, for example, conductive resin as the conductive casing. Alternatively, a metal plate may be adhered to a non-conductive resin casing.

Claims

1. An electronic device for vehicles comprising:

a printed circuit board (30) that is mounted with an electronic component to configure a predetermined electronic circuit;
 a conductive casing (10, 40) that stores the printed circuit board;
 a connecting part that is arranged between the conductive casing (10, 40) and the printed circuit board (30), wherein
 a resin film (38) for preventing from being soldered is arranged at a board surface of the printed circuit board (30) to be capacitively coupled with the connecting part,
 the connecting part is configured to be capacitively coupled with a conductor pattern of the printed circuit board so as to guide radiation noise from the printed circuit board to the conductive casing (10, 40),
 the connecting part is configured by a number of protruding parts (44), which are arranged to protrude to the conductive casing (10, 40) having a gap (D) between the conductor pattern and the protruding part (44), and are capacitively coupled with the conductor pattern through spacing arranged in the gap (D),
 the distance (D) between a ground pattern (31) and the protruding part (44) is larger than the thickness of the solder resist (38) located on top of the ground pattern (31) so there is no direct mechanical contact between the solder resist (38) and the protruding part (44), and
 the number or size of the protruding parts (44) is configured to allow radiation noise to be at a tolerance level.

2. The electronic device according to claim 1, wherein: the connecting part is capacitively coupled with the conductor pattern of the printed circuit board through the resin film and the spacing.
3. The electronic device according to claims 1 and 2, wherein:

at the printed circuit board, a plurality of grounding parts (36) for directly connecting to the conductive casing are respectively distributed at diverse positions, which are different from a position of the conductor pattern to be capacitively coupled with the connecting part; and
 the radiation noise from the printed circuit board is reduced through capacitive coupling between the connecting part and the conductive casing and the direct connection between each of the plurality of grounding parts and the conductive casing.

Patentansprüche

1. Elektronische Vorrichtung für Fahrzeuge, umfassend:

eine Leiterplatte (30), die mit einer elektronischen Komponente verbaut ist, um eine vorbestimmte elektronische Schaltung zu konfigurieren;
 ein leitfähiges Gehäuse (10, 40), das die Leiterplatte aufnimmt;
 einen verbindenden Teil, der zwischen dem leitfähigen Gehäuse (10, 40) und der Leiterplatte (30) angeordnet ist, wobei
 ein Harzfilm (38), der ein Lötten verhindert, an einer Plattenoberfläche der Leiterplatte (30) dazu angeordnet ist, kapazitiv mit dem verbindenden Teil gekoppelt zu sein,
 der verbindende Teil dazu konfiguriert ist, kapazitiv mit einer Leiterstruktur der Leiterplatte gekoppelt zu sein, um Strahlungsrauschen von der Leiterplatte auf das leitfähige Gehäuse (10, 40) zu leiten;
 der verbindende Teil durch eine Anzahl von vorstehenden Teilen (44) konfiguriert ist, welche dazu angeordnet sind, mit einem Zwischenraum (D) zwischen der Leiterstruktur und dem vorstehenden Teil (44) zu dem leitfähigen Gehäuse (10, 40) hin vorzustehen, und über einen in dem Zwischenraum (D) angeordneten Abstand kapazitiv mit der Leiterstruktur gekoppelt sind,
 der Abstand (D) zwischen einer Erdungsstruktur (31) und dem vorstehenden Teil (44) größer ist als die Dicke des Lötresists (38), das sich auf der Oberseite der Erdungsstruktur (31) befindet, so dass kein direkter mechanischer Kontakt zwischen dem Lötresist (38) und dem vorstehenden Teil (44) besteht, und
 die Anzahl oder Größe der vorstehenden Teile (44) dazu konfiguriert ist, Strahlungsrauschen auf einem tolerierbaren Niveau zu erlauben.

2. Elektronische Vorrichtung nach Anspruch 1, wobei: der verbindende Teil über den Harzfilm und den Zwischenraum kapazitiv mit der Leiterstruktur der Leiterplatte gekoppelt ist.

3. Elektronische Vorrichtung nach Ansprüchen 1 und 2, wobei:

an der Leiterplatte eine Vielzahl von erdenden Teilen (36) zur direkten Verbindung mit dem leitfähigen Gehäuse jeweils an diversen Positionen verteilt sind, welche sich von einer Position der Leiterplatte unterscheiden, um kapazitiv mit dem verbindenden Teil gekoppelt zu sein; und
 das Strahlungsrauschen von der Leiterplatte durch kapazitive Kopplung zwischen dem ver-

bindenden Teil und dem leitfähigen Gehäuse und die direkte Verbindung zwischen jedem der Vielzahl von erdenden Teilen und dem leitfähigen Gehäuse reduziert wird.

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Revendications

1. Dispositif électronique pour véhicules, comprenant :

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une carte de circuit imprimé (30) qui est montée avec un composant électronique en vue de configurer un circuit électronique prédéterminé ;
un boîtier conducteur (10, 40) qui stocke la carte de circuit imprimé ;
une partie de connexion qui est agencée entre le boîtier conducteur (10, 40) et la carte de circuit imprimé (30), dans lequel :

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un film de résine (38) destiné à empêcher toute soudure est agencé au niveau d'une surface de carte de la carte de circuit imprimé (30) en vue d'un couplage capacitif avec la partie de connexion ;
la partie de connexion est configurée de manière à être couplée de façon capacitive avec un tracé conducteur de la carte de circuit imprimé de manière à guider un bruit de rayonnement de la carte de circuit imprimé vers le boîtier conducteur (10, 40) ;
la partie de connexion est configurée par un nombre de parties saillantes (44), lesquelles sont agencées de manière à faire saillie au niveau du boîtier conducteur (10, 40) présentant un espace (D) entre le tracé conducteur et la partie saillante (44), et sont couplées de manière capacitive avec le tracé conducteur par l'intermédiaire d'un espacement agencé dans l'espace (D) ;
la distance (D) entre un motif de masse (31) et la partie saillante (44) est supérieure à l'épaisseur de la réserve de soudure (38) située au-dessus du motif de masse (31), de sorte qu'il n'existe pas de contact mécanique direct entre la réserve de soudure (38) et la partie saillante (44) ; et
le nombre ou la taille des parties saillantes (44) est configuré(e) de manière à permettre au bruit de rayonnement de se situer à un niveau de tolérance.

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2. Dispositif électronique selon la revendication 1, dans lequel :

la partie de connexion est couplée de manière capacitive avec le tracé conducteur de la carte de circuit imprimé à travers le film de résine et l'espacement.

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3. Dispositif électronique selon les revendications 1 et

2, dans lequel :

au niveau de la carte de circuit imprimé, les parties d'une pluralité de parties de mise à la terre (36), destinées à être directement connectées au boîtier conducteur, sont respectivement réparties sur diverses positions, lesquelles sont différentes d'une position du tracé conducteur à coupler de manière capacitive avec la partie de connexion ; et

le bruit de rayonnement provenant de la carte de circuit imprimé est réduit à travers le couplage capacitif entre la partie de connexion et le boîtier conducteur, et à travers la connexion directe entre chaque partie de la pluralité de parties de mise à la terre et le boîtier conducteur.

FIG. 1A

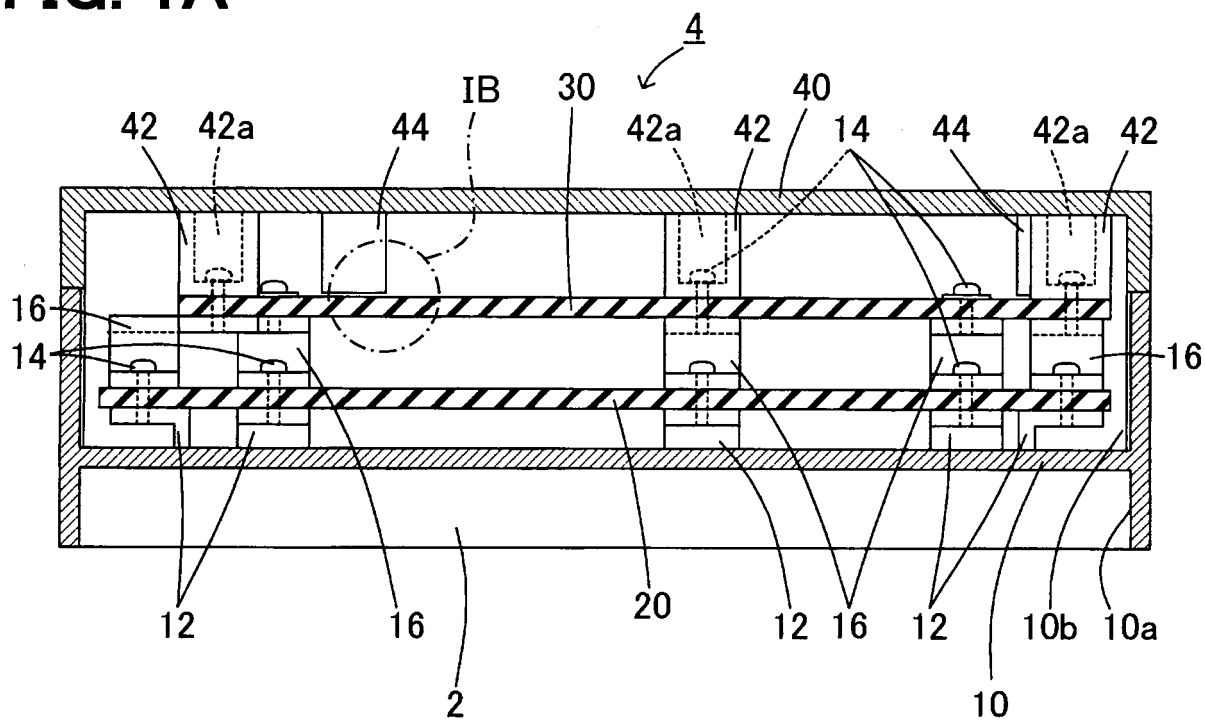


FIG. 1B

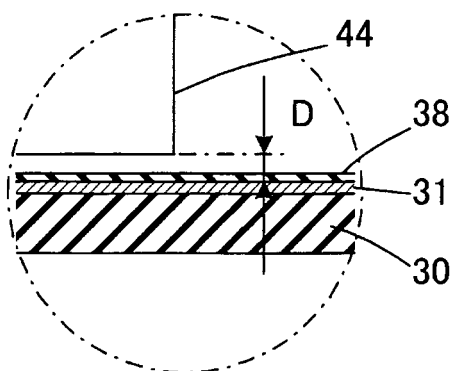


FIG. 2

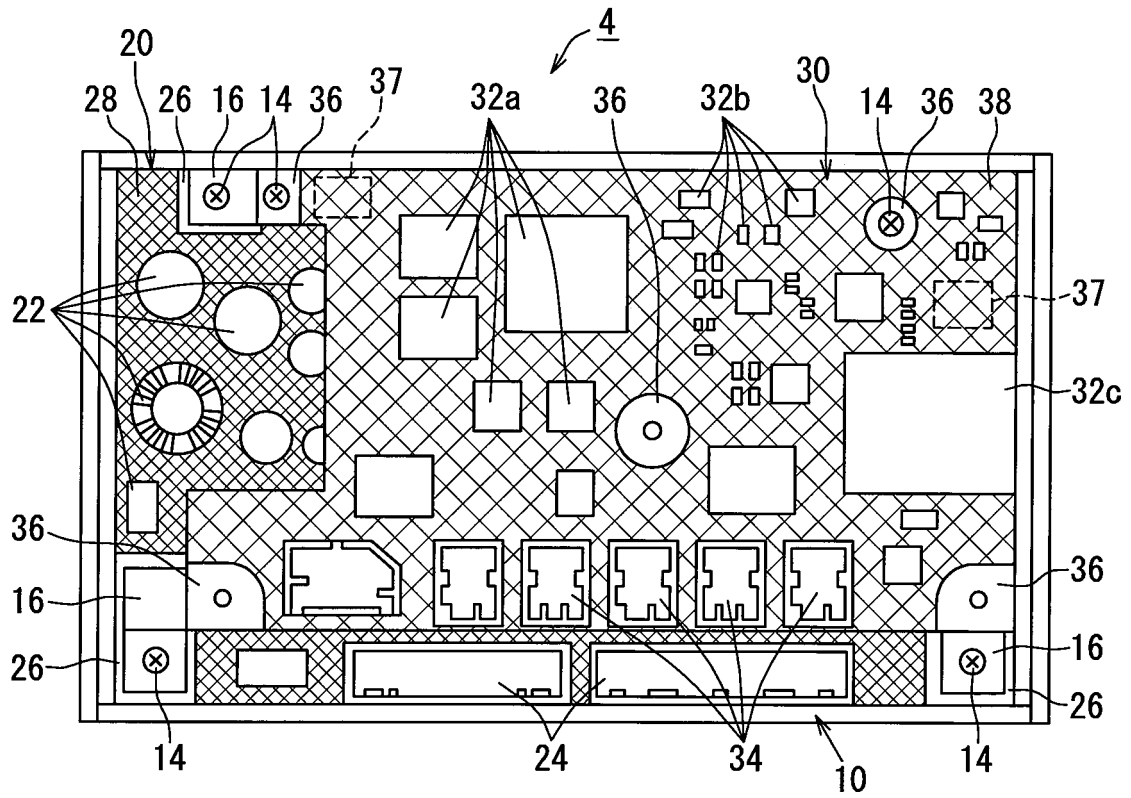
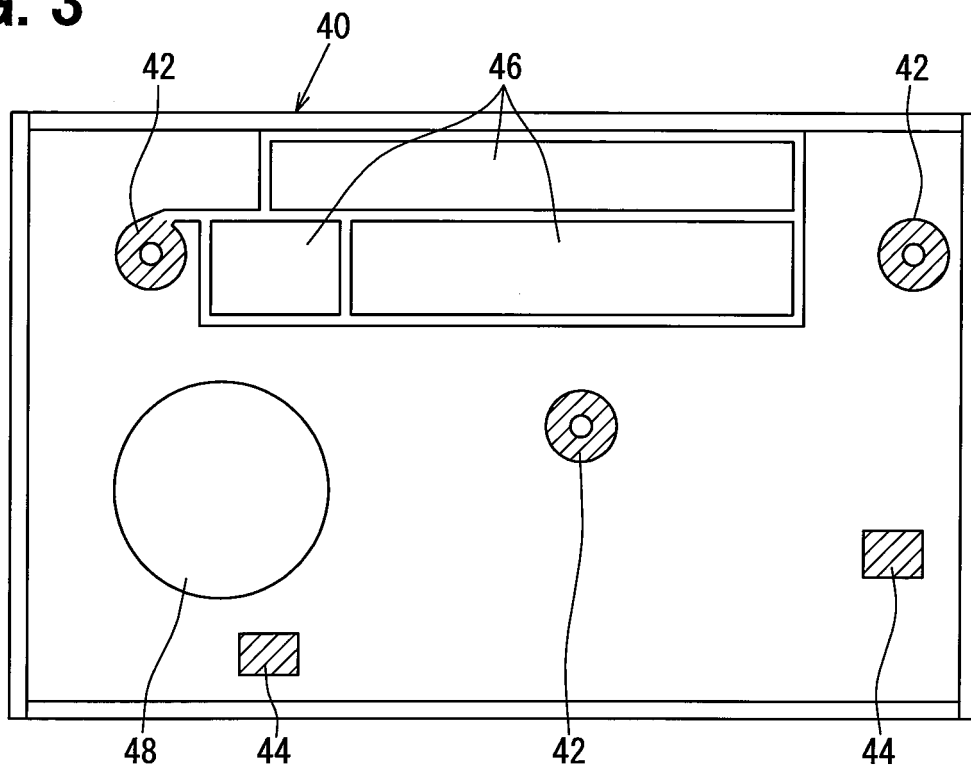


FIG. 3



REFERENCES CITED IN THE DESCRIPTION

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